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Application No. 10/645,333
Filed: August 21, 2003
TC Art Unit: 1742
Confirmation No.: 7603

REMARKS

Claims 1-10 are currently pending. Claims 1-10 stand rejected under 35 U.S.C. § 103(a). Claim 1 has been amended. The Applicants respectfully traverse the grounds for rejection in view of the above amendments and for the reasons provided below and requested withdrawal thereof.

SECTION 103(a) REJECTIONS

The Examiner has rejected claims 1-10 under 35 U.S.C. 103(a) as being unpatentable over Japanese Laid-Open Published Patent Application Number 10-168502 (the "'502 Reference") in view of U.S. Patent Number 5,685,357 to Kato, et al. ("Kato"). More specifically, the Examiner asserts that, the '502 reference teaches all of the steps of the recited method, conceding, however, that, it does not recite forming the sheet-shaped solid material into granules; forming a composite material by melting metal material portion of the granules and kneading the melted metal and the carbon nano material portions of the granules; and mold-injecting the composite material to form a composite metal product. The Examiner relies on Kato as teaching those steps not taught, mentioned or suggested by the '502 reference.

The invention as claimed recites a method for producing composite metal products, e.g., for electronic equipment such as heat sinks, heat shields, and bearings. The composite metal products are manufactured from carbon nano materials and powderized metal materials using injection-molding techniques. See, e.g., Specification, page 3, lines 19-21. The Applicants disclose that composite metal parts are difficult to mold and,

WEINGARTEN, SCHURGIN,
GAGNEBIN & LEBOVICI LLP
TEL. (617) 542-2290
FAX. (617) 451-0313

more particularly, to mold by hot pressing using mixtures of carbon nano materials and pulverized metal materials having particles sizes between 5μm and 1nm. See, e.g., Id., page 1, lines 20-29. The Applicants solved this problem in the art in a two-step process by, first, hot-pressing carbon nano materials and pulverized metal materials into a sheet-shaped solid material and, second, forming the sheet-shaped solid materials into granules and feeding the granules of carbon nano materials and pulverized metal materials into an injection-molding device before re-melting the pulverized metal materials. In short, the first step of the process produces a composite material for use in the second step. What could not be accomplished in the prior art by the first step alone or the second step alone can be accomplished by combining the two steps as claimed.

The '502 reference, in contrast, teaches a method for hot-pressing composite material that consists of a crystalline carbon material and a metal powder -- or just the first step of the claimed invention. See, e.g., Patent Abstracts of Japan, Publication Number 10-168502, Abstract. However, the sheet-shaped end product composite material produced by the '502 product is not used as an input for a second injection-molding process.

As disclosed in the Specification, metal products "are difficult to be molded by a hot press from a composite material containing the crystalline carbon material." Id., page 1, lines 27-29 (Emphasis added). Hence, one of ordinary skill in the art would not have thought to use the teachings of the '502 reference to form non-sheet-shaped composite metal products such as heat sinks, shields and bearings due to the difficulty thereof.

WEINGARTEN, SCHURGIN,
GAGNEBIN & LEBOVICI LLP
TEL. (617) 542-2290
FAX. (617) 451-0313

Nor would one of ordinary skill in the art have found Kato useful in combination with the '502 reference to solve the problem solved by the present invention. The Kato reference teaches melt-blending a metal material and producing a shaped metal part by injection molding techniques - the second step of the claimed invention. See, e.g., U.S. Patent Number 5,685,357, col. 3, line 67 to col. 4, line 3. However, according to Kato:

> These metallic feeds can be prepared by various methods. For instance, ingots may be chipped mechanically. Alternatively, shavings which result from mechanical cutting operations may be used. . . . The metallic feeds prepared by these methods are of relatively small size and are very easily handled, as opposed to metallic powder.

Id., col. 4, lines 8-17 (Emphasis added). Thus, Kato expressly teaches away from using metallic powder in connection with injection-molding, suggesting, instead, the use of shavings and chips of metal materials. Hence, one desiring to prepare composite metal products out of carbon nano materials and powderized metal materials would have been dissuaded from using Kato. The present invention provides a method for preparing composite metal products out of carbon nano materials and powderized metal materials by, first, hot-pressing the sheet-shaped solid material and, second, by forming the sheet-shaped solid material into granules; re-heating the granules to re-melt the metal material in the granules; kneading the granules to re-blend the re-melted metal material and the carbon nano material into a composite material; and injecting the thus-formed composite material into a composite metal product.

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Accordingly, the Applicants respectfully maintain that claim 1 and all claims depending therefrom are not made obvious in view of the '502 reference and Kato and, further, satisfy all of the requirements under 35 U.S.C. §100, *et seq.* and are in condition for allowance.

The Examiner is encouraged to telephone the undersigned attorney to discuss any matter that would expedite allowance of the present application.

Respectfully submitted,

ATSUSHI KOIDE ET AL.

By: _____
Charles L. Gagnebin, III
Registration No. 25,467
Attorney for Applicant(s)

WEINGARTEN, SCHURGIN,
GAGNEBIN & LEBOVICI LLP
Ten Post Office Square
Boston, MA 02109
Telephone: (617) 542-2290
Telecopier: (617) 451-0313

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